Subject: New Fast Kriging Semivariogram Spherical Model Incorrect?
Posted by David Fanning on Wed, 16 Oct 2013 14:10:21 GMT
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Folks,

I have been writing a new cgKrig2D function for my own use that provides orders of magnitude faster kriging for general use than the (extremely!) slow Krig2D function that is supplied with all currently released versions of IDL. In doing so, I have come to believe that the Spherical modeling function in both the old version of Krig2D and in the new version Chris released here last week is incorrect.

I base my conclusion on the mathematical models described here:

http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html #//009z00000076000000.htm

The original version of the spherical mathematical model used this code:

```
r = d/t[0]
v = t[1] + t[2] * (r * (1.5 - 0.5 * r *r) > 0)
z = where(d eq 0, count)
if count ne 0 then v[z] = 0
return, (t[1] + t[2]) - v
```

Chris believed this to be wrong, and offered this code in the new, faster, version:

```
r = d/t[0] < 1
v = t[2]*(1 - r*(1.5 - 0.5*r*r))
v[WHERE(r eq 0, /NULL)] = t[1] + t[2]
return, v
```

This also appears to be incorrect to me. I think the correct version is something like this:

```
r = d/t[0]
v = t[2]*(1 - r*(1.5 - 0.5*r*r)) + t[1]
v[WHERE(d eq 0, /NULL)] = 0
v[WHERE(d gt t[0], /NULL)] = t[1] + t[2]
return, v
```

What think you experts?

Cheers,

David

--
David Fanning, Ph.D.
Fanning Software Consulting, Inc.
Coyote's Guide to IDL Programming: http://www.idlcoyote.com/
Sepore ma de ni thue. ("Perhaps thou speakest truth.")

Subject: Re: New Fast Kriging Semivariogram Spherical Model Incorrect?
Posted by David Fanning on Wed, 16 Oct 2013 14:54:43 GMT
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David Fanning writes:

> I have been writing a new cgKrig2D function for my own use that provides
> orders of magnitude faster kriging for general use than the (extremely!)
> slow Krig2D function that is supplied with all currently released
> versions of IDL. In doing so, I have come to believe that the Spherical
> modeling function in both the old version of Krig2D and in the new
> version Chris released here last week is incorrect.

Now I think the Exponential modeling function is incorrect, too, based on this reference (and the one I provided previously):

http://www.nbb.cornell.edu/neurobio/land/OldStudentProjects/ cs490-94to95/clang/kriging.html

It is listed as:

```
r = t[2] * exp((-3./t[0]) * d)
r[WHERE(d eq 0, /NULL)] = t[1] + t[2]
return, r
```

According to my references, this should be:

```
r = t[2] * exp((-3./t[0]) * d)
r[WHERE(d eq 0 /NULL)] = 0
return, r
```

Cheers,

David
--
David Fanning, Ph.D.

Subject: Re: New Fast Kriging Semivariogram Spherical Model Incorrect?
Posted by chris_torrence@NOSPAM on Thu, 17 Oct 2013 04:00:24 GMT
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On Wednesday, October 16, 2013 8:54:43 AM UTC-6, David Fanning wrote:
> David Fanning writes:
>
>
>
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>
>
>
> David
>
> --
>
> David Fanning, Ph.D.
>
> Fanning Software Consulting, Inc.
>
> Coyote's Guide to IDL Programming: http://www.idlcoyote.com/
>
> Sepore ma de ni thue. ("Perhaps thou speakest truth.")

Hi David,

I think that our two methods actually agree. I believe that your code is calculating the "variogram" instead of the "covariance". So:
Mine = C0 + C1 - Yours

By the way, in the spherical case, you have that extra line with WHERE(d gt t[0]). I don't think you need this if you use the "r = d/t[0] < 1". The < 1 will clamp the values so the equation works out. It might be faster to do the <1, but I can't remember whether I tested the speed with the 2 different ways.

Anyway, on a slightly different note, it would be *great* if you didn't create your own cgKrig2D. I worry that we are fragmenting the IDL user base and creating confusion. If there is something wrong with the latest version of Krig2D, we should figure out the right solution and fix the code

that ships with IDL. If people want the faster code, it has already been posted here, and will be made available in the official release in just a couple of months or less.

Thanks in advance for considering my proposal.

Cheers,
Chris
VIS

Subject: Re: New Fast Kriging Semivariogram Spherical Model Incorrect?
Posted by David Fanning on Thu, 17 Oct 2013 04:20:13 GMT
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Chris Torrence writes:

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Yes, I understand this and I'm sympathetic. I don't like to duplicate code either. And I haven't actually released this. I'm just trying to make it work with some mapping software I've been working on. Since the other code is in the Coyote Library, I have the age old problem of what to do with code I need to make it work. Relying on code that will come out in IDL 8.3 is not that attractive to me, since I think the vast majority of the people who use the Coyote Library don't have the latest version of the software. That's basically why I went to the trouble of writing my own. Plus, I wanted to learn how it works. Nothing like writing your own algorithms to teach you how little you know about something, I guess. ;-)

No, I am happy to use your software. I just want to be sure it works. You probably haven't gotten around to it yet, but I can seem to get the new software working with gridded input. I really don't know what that is about!

Cheers,

David

--
David Fanning, Ph.D.
Fanning Software Consulting, Inc.
Coyote's Guide to IDL Programming: http://www.idlcoyote.com/

Sepore ma de ni thue. ("Perhaps thou speakest truth.")

Subject: Re: New Fast Kriging Semivariogram Spherical Model Incorrect?
Posted by chris_torrence@NOSPAM on Thu, 17 Oct 2013 04:24:23 GMT
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On Wednesday, October 16, 2013 10:20:13 PM UTC-6, David Fanning wrote:
> Chris Torrence writes:
>
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>
>> Anyway, on a slightly different note, it would be *great* if you didn't create your own cgKrig2D. I worry that we are fragmenting the IDL user base and creating confusion. If there is something wrong with the latest version of Krig2D, we should figure out the right solution and fix the code that ships with IDL. If people want the faster code, it has already been posted here, and will be made available in the official release in just a couple of months or less.
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Sounds great David. Thanks for understanding. Also, see my other post regarding the bug in my code. :-)
-Chris
